DOCUMENT RESUME

ED 269 940 EC 182 725

AUTHOR Blenkhorn, Paul; And Others

TITLE Computer Assisted Learning for the V.H. Information Sheets, Nos. 1-6, November 1983-August 1985.

INSTITUTION Birmingham Univ. (England). Research Centre for the Education of the Visually Handicapped.

PUB DATE 85
NOTE 62p.; Print is light and broken. For related document, see EC 182 726.
PUB TYPE Guides - Non-Classroom Use (055)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Blindness; Braille; Communication Aids (for Disabled); *Computer Assisted Instruction; Computers; *Computer Software; Electromechanical Aids; Elementary Secondary Education; Equipment; Foreign Countries; *Visual Impairments
IDENTIFIERS England; Microwriter; Vesabraille

ABSTRACT

Information sheets on resources, assistance, software, and hardware for visually handicapped (VH) students in England are collected in this document. The first information sheet, "Getting Help--What, Where, and Who," lists general sources of assistance, equipment, and books. The second information sheet, "Computer Hardware Used in the Education of the Visually Handicapped," details the requirements for a computer system, including monitors, tape and disc systems, and printers. Information sheet 3, "Some Guidelines for Managing the Micro in School," discusses hardware and software management, and the fourth information sheet, "Computer Braille Code," describes computer devices that use Braille. Information sheet 5, "Versabraille," provides an overview of one such device and its use in education. The final information sheet, "Microwriter," considers potential applications of the microcomputer to the education of the visually impaired. (RB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED269940

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 1

GETTING HELP - WHAT, WHERE, AND WHO

PAUL BLENKHORN

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED, BY
M.J. Tobin
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

NOVEMBER, 1983

RESEARCH CENTRE FOR THE EDUCATION
OF THE VISUALLY HANDICAPPED
FACULTY OF EDUCATION
UNIVERSITY OF BIRMINGHAM

EC182725

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 1

GETTING HELP - WHAT, WHERE, AND WHO

INTRODUCTION

One of the problems which I have encountered over the past few weeks when travelling around various schools is that there is some doubt as to where to get information, software, hardware, etc. To try to alleviate some part of these problems I have put together this information sheet. This is NOT a comprehensive document and in some cases will be downright wrong - the situation seems to vary with geographical area, status of school, and with the attitudes of the local L.E.A. However, this information sheet should provide some guidelines and will give you somewhere to start.

GENERAL SOURCES OF ASSISTANCE

The first source of information and assistance for general enquiries should be the local L.E.A. Although many V.H. schools are not, in fact, L.E.A. schools most of the L.E.A.'s are quite willing to help. A further source of information are the Microelectronics Education Programme (MEP) Regional Information Centres. Note, though, that if you have not contacted your L.E.A. first (if appropriate) then the MEP will probably refer you to them. In addition, the MEP has set up four regional SEMERCs (Special Education Micro Electronic Resource Centre), that should have a range of both hardware and software available, particularly for the needs of special education. The addresses of the MEP information centres and the SEMERCs can be found in Appendices A and B respectively.

If you have any problems which are not solvable by the above, then call me at the Research Centre and I shall try to help.

PURCHASING EQUIPMENT (HARDWARE) AND FAULTS WITH EQUIPMENT

If at all possible, it is best to obtain equipment through your L.E.A. They may well be able to obtain discounts and should help if faults occur. If buying specialised equipment other than the basic computer, monitor, disk drive(s) and printer, then you would be well advised to try it out first. Your nearest SEMERC is quite likely to have the hardware there for you to go along and try. Any of the general sources given above should be willing to give you advice.

SOFTWARE

The major piece of advice which I can give on getting software is that you should try it out before you buy it. The L.E.A., MEP, or SEMERC should all have copies of published software which you can go and look at. In addition, they might have public domain software (i.e. programs which can be freely copied) which you are free to go along and copy. Some general sources of software (for the BBC Model B) are given in Appendix C. These have not been tested at the Research Centre and are not specifically for the V.H. but some may prove to be of interest.

COURSES

Yet again the local L.E.A. may well organise courses ranging from a simple introduction to the use of the computer in the classroom to programming in assembler. These courses can, however, become full very quickly and it is wise to get in early. As an alternative, if necessary, I can be persuaded to come along to a given school or area and give a short course in certain subject areas.

PRODUCING SOFTWARE FOR THE VISUALLY HANDICAPPED

If anyone out there wishes to produce software for the V.H., then please do call me. Time permitting, I will try to give help and advice - I might even be able to save you the trouble of doing it yourself if it is being done elsewhere.

BOOKS

The L.E.A., MEP, and SEMERC may all have books relating to many aspects of computing, together with the latest copies of magazines and journals. However, you will probably not be allowed to take these away. The Research Centre is building up a collection of books in the general area of computer assisted learning, details of which are given in Appendix D. Again, these are for reference only.

APPENDIX A

MEP ADDRESSES

THE NORTH
Resources Centre,
Newcastle Polytechnic,
Coach Lane Campus,
Newcastle upon Tyne NE7 7XA
0632 700424
Dir: R. Edwardson.

W. & N. YORKSHIRE
Queenswood House,
Leads Polytecynic,
Becketts Park Site,
Leeds LS6 3QS
0532 783437/8
Dir: R. Leigh.

S. YORKS. & HUMBERSIDE
Educational Development Centre,
Chequer Road,
Doncaster.
Doncaster 68935, X.53
Dir: Dr P. Avis.

E. MIDLANDS
Towers Library,
Loughborough Univ. of Technology,
Loughborough,
Leicestershire LE11 3TU
0509 37398
Dir: Dr M. Bramer.

EASTERN
Chelmer Institute of H.E.,
Victoria Road South,
Chelmsford,
Essex.
0245 354491
Dir: D. Want.

CHILTERN
Chiltern Regional Centre,
AUCBE,
Endymion Road,
Hatfield,
Herts. AL10 8AU
070 72 66121
Dir: Dr B. Tagg.

SOUTHERN COUNTIES
Southern Region Microelectronics
Information Centre,
Furnace Drive,
Furnace Green,
Crawley RH10 6JB
0293 546216
Dir: P. Neate

SOUTH WEST
Bristol Polytechnic,
Coldharbour Lane,
Frenchay,
Bristol RS16 1QY
0272 656261
Dir: R. Margetts.

CAPITAL
ILEA Education Computer Centre,
Bethwin Road,
London SE5 0PQ
01 735 1895
Dir: M. Doran.

WALES
Welsh Joint Education Committee,
4th Floor, Arlbee House,
Greyfrairs Road,
Cardiff CF1 3AE
0222 25511

W. MIDLANDS
MACE,
Four Dwellings School,
Dwellings Lane,
Quinton,
Birmingham B32 1RJ
021 421 6361
Dir: R. Conibear.

MERSEYSIDE WITH CHESHIRE
Regional Information Centre,
Rodney House,
70 Mount Pleasant,
Liverpool L3 5UX
051 708 6620, X.27
Dir: Mrs. S. Evans.

G. MANCHESTER & LANCS.
Manchester Polytechnic,
Didsbury School of Education,
799 Wilmslow Road,
Manchester M20 8RR
061 445 0780
Dir: R. Chantry-Price.

N. IRELAND
MICRONET Centre,
South Building,
New Univ. of Ulster,
Coleraine,
N. Ireland.
0265 4141, X.341
Dir: H. McMahon.

APPENDIX B

SEMERC ADDRESSES

NEWCASTLE
Newcastle Polytechnic,
Coach Lane Campus,
Newcastle upon Tyne NE7 7XA
0632 665057
Manager: Colin Richards.

MANCHESTER
Manchester College of H.E.,
Hathersage Road,
Manchester M13 0JA
061 225 9054
Manager: Bob Dyke.

REDBRIDGE
Dane Centre,
Melbourne Road,
Ilford,
Essex.
01 478 6363
Manager: Mrs. Jean Tait.

BRISTOL
Faculty of Education,
Bristol Polytechnic,
Redland Hill,
Bristol BS6 6UZ
0272 7412151, X.52

APPENDIX C

BBC MICRO SOURCES OF SOFTWARE

This list of software supplies is based mainly on one produced by the Advisory Unit for Computer Based Education. It has not been produced with the visually handicapped in mind but some of the information may be useful.

A B DESIGNS

81 Sutton Common Road, Sutton, Surrey SM1 3HN

This company provides two programs, both highly sophisticated drawing and design packages. Particular features include curve smoothing, perspective drawing, hidden line removal, colour filling with up to 20 or 48 shades and elastic band line drawing. Screen images can be saved on tape or disc. Program 2 provides higher resolution and more colours than Program 1 plus a few extra facilities. Prices are £35.50 and £50.50 for cassette versions, £5 more for disc versions.

ACORNSOFT LTD.

c/o Vector Marketing Ltd., Dennington Industrial Estate, Wellingborough, Northants NN8 2RL

Over 20 programs, generally to a high technical standard and covering games, education and other applications. Acornsoft are also now publishing the educational programs previously produced by ESM (see their entry). Particularly worth noting are the following packages:

Business Games	Tree of Knowledge	Peeko-Computer
Creative Graphics	Graphs and Charts	LISP
FORTH	VIEW word processing ROM	

Prices range from £8.65 to £14.65 per csssette.

AUCBE

Endymion Road, Hatfield, Herts.

Information retrieval package QUEST available for the BBC micro plus several other packages under development.

BBC SOFTWARE

35 Marylebone High Street, London W1M 4AA

Currently 8 programs are available including:

Early Learning Music Painting Drawing

at a price of £10.00.

BEEBUG

Dept. 13, 374 Wandsworth Road, London SW8 4TE

BEEBUG is the National User Group for users of the BBC micro and offers a small library of programs to members.

BOURNE EDUCATIONAL SOFTWARE

Bedfield Lane, Headbourne Worthy, Winchester, Hants. SO23 7SQ

Three programs for primary schools based on simple information storage and retrieval, hangman game and simple tree structures. Prices £4.95 to £7.95.

CAMBRIDGE MICRO SOFTWARE

Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU

Source of FACTFILE, a simple information retrieval system which is being supplied free to all primary schools as part of the DOI scheme otherwise cost is £15. A further series of 7 packages covering various topics at secondary level will be available shortly at a similar price.

CHALKSOFT

Lowmoor Cottage, Tonedale, Wellington, Somerset TA2 1OAL

A range of educational programs aimed mainly at primary schools and some for lower secondary. Prices range from £5.95.

CHRIS HALL SOFTWARE ENGINEERING

47 Bush Lane, Freckleton, Lancs. PR4 1SB

A series of combined software/hardware packages suitable for the laboratory and other experimental work - temperature data logging, illumination data logging, humidity data logging, and real time clock/calendar. Prices range from £18.00 to £35.50.

COMPUTER CONCEPTS

16 Wayside, Chipperfield, Herts. WD4 9JJ

Supplies the WORDWISE word processing package in ROM at £39.00.

CONTEX COMPUTING

15 Woodlands Close, Cople, Bedford MK44 3UE

Two interesting programs aimed at the "Adult Educational" market are TYPING TUTOR at £10 and SPREADSHEET at £8.

DIGITAL FANTASIA DEPT. ACU

24 Norbreck Road, Norbreck, Blackpool, Lancs.

A series of 10 adventure games at £10.29 each.

DOCTOR SOFT

258 Coneygree Road, Peterborough PE2 8LR

Various games for sale.

MRS. J. DOWDLE

70 Stoke Road, Bletchley, Milton Keynes (tele: 0908 648 368)

An increasing number of programs available all designed for educational use in conjunction with teachers and aimed exclusively at primary schools. Prices are of the order of £3.00 to £4.00.

ESM

Duke Street, Wisbech, Cambridge (tele: 0945 63444)

Eight collections of programs are available aimed principally at primary schools. Those on Word Hunt, Word Sequencing and Sentence Sequencing have received favourable comment from teachers.

GAELSETT SOFTWARE

44 Exeter Close, Stevenage, Herts. SG1 4PW

The ECPG program extends the range of shades possible with the GCOL command. Cost £10

GARLAND COMPUTING

35 Dean Hill, Plymouth PL9 9AF (tele: 0752 41287)

Thirteen programs are available on various science simulations and applications. Prices range from £9.50 to £29.50.

GEM SOFTWARE

1 Oswald Road, Leamington Spa, Warwicks. CV32 6EW

About five programs available at £4.99 and £5.99 aimed at primary maths.

GEMINI MARKETING LTD.

18A Littleham Road, Devon EX8 2QG

A range of business and home applications including Cashbook Accounting System at £95, Computerised Card Index System at £19.50, Stock Control System at £19.95, Commercial Accounting at £19.95, and BEEBCALC Spreadsheet Analysis also at £19.95.

GINN MICROCOMPUTER SOFTWARE

Ginn and Company Ltd., Prebendal House, Parson's Fee, Aylesbury, Buckinghamshire HP20 2QZ

A growing range of high quality educational software packages aimed essentially at primary schools. The first package based on the wreck of the Mary Rose looks excellent and is now available at £32.50. Other packages are scheduled for release from May 1983 onwards. Well worth investigating.

GOLEM LTD.

77 Qualitas, Bracknell, Berks. RG12 4QG

Some educational programs aimed at primary, plus utilities and games at prices from £6.90 to £9.20.

GUILDFORD COMPUTER CENTRE

1 The Quadrant, Bridge Street, Guildford, Surrey.

Business software.

HEINEMAN COMPUTERS IN EDUCATION

FREEPOST EM17, The Windmill Press, Kingswood, Tadworth, Surrey KT20 6BR

Mathematics with a micro Volume 1 is a collection of 30 programs for teaching mathematics up to 'O' level at £21.28 including 80 page teacher's guide.

HEXADECIMAL PRESS

23 Torrington Gardens, Bounds Green, London N11 2AB

Various games and utilities.

IJK SOFTWARE LTD.

9 King Street, Blackpool, Lancashire.

Mostly games plus simple word processor.

KANSAS CITY SYSTEMS

Unit 3, Sutton Springs Wood, Chesterfield S44 5XF

MICROTYPE is a typing tutor for £12.50 plus an adventure game, Dracula Island.

LEOSOFT

65 New Road, Brixham, Devon.

Card index filing system, home banking system, cash book and ledger system and an educational function plotter with zoom for maths.

LEVEL 9 COMPUTING

229 Hughenden Road, High Wycombe, Bucks. HP13 5PG

FORTH for the BBC micro is available at £15 plus a number of adventure type games at £9.90.

LONGMAN MICRO SOFTWARE

Longman Group Resources Unit, 33-35 Tanner Row, York YO1 1JP (tele: 0904 20801)

The ITMA Project based at the College of St. Mark and St. John at Plymouth are developing a range of programs for the BBC micro, some of which are conversions of earlier 380Z programs. These will all be published through Longmans. For further information on ITMA contact Mrs. Jan Stewart, College of St. Mark and St. John, Derriford Road, Plymouth PL6 8BH.

MICRO-AID

25 Fore Street, Praze, Camborne, Cornwall.

Various games, business applications (Cash Book, Payroll, etc.) and Utilities at prices from £1.00 to £11.90.

MICRO POWER LTD.

8/8a Regent Street, Chapel Allerton, Leeds LS7 4PE

Mostly game plus a few fairly routine educational programs.

MUSE

Freepost, Bromsgrove, Worcs. B61 7BR

Library of software for the BBC micro and others available to MUSE members.

PAVIC PRODUCTIONS

Dept. of Education Services, Sheffield City Polytechnic, 36 Collegiate Crescent, Sheffield S10 2BP

Package for French 'O' level and CSE revision for £10.

PENTLAND SOFTWARE LTD.

39 Scollon Avenue, Bonnyrigg, Midlothian EH79 3QB

Software for the small business - Payroll, Tax and N.I. for £9.95.

SALAMANDER SOFTWARE

17 Norfolk Road, Brighton, East Sussex BN1 4AA

The EDG graphics package looks to be quite an interesting package for generating a wide variety of coloured graphics images on the screen. The user interface is a little difficult to master but this looks to be one of the best sketching packages around at the moment. Price £14.50 to schools.

SIMON W. HESSEL

15 Lytham Court, Cardwell Crescent, Sunninghill, Berks.

Produces The World Travel Game and Great Britain Ltd. both programs with educational potential. Price £5.95, £6.95.

SOFTWARE FOR ALL

72 North Street, Romford, Essex.

Games programs only.

SOFTWARE INVASION

50 Elborough Street, Southfields, London SW18 5DN

Games programs only.

SOFTWARE SAVERS

Temple House, 43-48 New Street, Birmingham B2 4LH

Eight business applications programs are available at £10.00 each plus a Word Processor in ROM at £25 and various games at prices from £7 to £10.

STABLE SOFTWARE

Barn Close, Compton Street, Compton, Nr. Winchester, Hampshire SO21 2AT

The program SCRED is a full screen editor (using mode 7) and simple word processor for £18 (tape) or £21 (disc).

SUPERIOR SOFTWARE

Dept. AU2, 69 Leeds Road, Bramhope, Leeds.

Games programs only.

A.J. VISION SERVICE LTD.

61 Jeddo Road, London W12 9ED

A number of programs of interest to schools - Simple Wordprocessor at £9.95, Record Changer (a computerised card index system) at £19.95, Options Timetable at £14.95, and Wordsmith (a more sophisticated word processor) at £19.95. The company say they are interested in writing educational software in conjunction with individual schools who can supply a specification.

WINDSOR COMPUTER CENTRE

1 Thames Avenue, Windsor, Berkshire.

Three programs are currently available. MULTIQUEST allows the teacher to set question papers on any subject which can then be worked at any level from infant to adult (could be useful for revision exercises. TEXLETTER is a simple to use text editor with very limited facilities while CESIL is an implementation of ICL computer language used in some computer studies courses. Prices range from £10 to £25.

ZENCOM SYSTEMS

64 Close Lane, Alsager, Cheshire ST7 2JT

Two programs on maths (equations, binary/hexadecimal arithmetic, trigonometry) and one on electrical theory (DC, Ohms Law, AC) at £8.90 per cassette.

APPENDIX D

BOOKS AND ARTICLES FOR REFERENCE AVAILABLE FROM

RESEARCH CENTRE FOR THE EDUCATION OF THE VISUALLY HANDICAPPED

This list reflects those books and articles currently available for reference at the Research Centre. Many more are on order and so this list is expected to grow.

BOOKS

A Practical Introduction to Pascal - with BS 6192.
I.R. Wilson, A.M. Addyman.
Macmillan Computer Science Series, ISBN 0 333 33340 3

Beginning Micro - PROLOG.
Richard Ennals.
Ellis Horwood Ltd., ISBN 0 85312 517 1

Introduction to Pascal.
Jim Welsh, John Elder.
Prentice Hall International, ISBN 0 13 491522 4

Learning with Computers.
Alfred Bork.
Digital Press, ISBN 0 932376 11 8

Microcomputers in Special Education.
Freddie Green, Robert Hart, Colin McCall, Ian Staples.
Longman for Schools Council, ISBN 0 582 39856 8

Mindstorms - Children, Computers, and Powerful Ideas.
Seymour Papert.
Harvester Press, ISBN 0 71080 472 5

The BBC Micro Revealed.
Jeremy Ruston.
Interface, ISBN 0 907563 15 5

The CP/M Handbook with MP/M.
Rodney Zaks.
Sybex, ISBN 0 89588 048 2

JOURNALS/PAPERS

Computer Education.
From June, 1983.

Educational Computing.
From November, 1983.

Digital Equipment Corporation. Technical Reports:

1. The use of interactive, computer-managed instruction to control the quality of self-paced training.
   Jesse Heines, September, 1978.

2. Evaluating interactive, computer-managed instruction.
   Jesse Heines, October, 1978.

3. Style and communication in interactive programming.
   Jesse Heines, June, 1979.

4. The three-pronged computer-based course development process.
   Jesse Heines and Ken Moreau, August, 1979.

5. Creating graphic displays on non-graphic terminals.
   Ken Moreau and Jesse Heines, August, 1979.

6. Tapping the appeal of games in instruction.
   Peter McVay, January, 1980.

7. The reliability of sequential testing.
   Jesse Heines, January, 1980.

8. Courseware development and the NSF.
   Jesse Heines, May, 1980.

9. Viewdata and training: what, where, and how much.
   Barry Scott, September, 1980.

10. The implications of window management for computer-based training.
    Michael Zimmerman and Jesse Heines, August, 1981.

11. The personal computer as an appliance - problem 1: integrating training and documentation.
    Jesse Heines, August, 1981.

12. Role of graphics in computer assisted learning.
    David Skyrme, May, 1982.

13. Basic concepts in knowledge-based systems.
    Jesse Heines, July, 1982.

14. The design of a rule-based CAI tutorial.
    Jesse Heines and Tim O'Shea, May, 1983.

15. Logic and recursion: the PROLOG twist.
    Jesse Heines, Jonathan Briggs, and Richard Ennals, May, 1983.

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 2

COMPUTER HARDWARE USED IN THE EDUCATION OF THE VISUALLY HANDICAPPED

By JIM ARMOUR and PAUL BLENKHORN

For WORKING GROUP ON COMMUNICATION AIDS

JUNE, 1984

RESEARCH CENTRE FOR THE EDUCATION
OF THE VISUALLY HANDICAPPED

FACULTY OF EDUCATION

UNIVERSITY OF BIRMINGHAM

COMPUTER HARDWARE USED IN THE EDUCATION OF THE VISUALLY HANDICAPPED

CONTENTS

1.	INTRODUCTION	1
2.	GENERAL ADVICE	1
3.	REQUIREMENTS FOR A BASIC SYSTEM	2
	3.1 MAIN TYPES OF MICRO USED IN EDUCATION	2
	3.2 MONITORS AND TELEVISIONS	3
	3.3 TAPE AND DISC SYSTEMS	4
	3.4 PRINTERS AND EMBOSSERS	5
	3.4.1 PRINTERS	5
	3.4.2 EMBOSSERS	6
	3.5 ADD ON DEVICES	7
	3.5.1 SPEECH SYNTHESIZERS	7
	3.5.2 ROBOTICS	8
	3.5.3 OTHER DEVICES	8
4.	STAND ALONE COMPUTERS	9
5.	FURTHER READING	12
6.	INDEX	13
	APPENDIX I MEP ADDRESSES	14
	APPENDIX II SEMERC ADDRESSES	15

1. INTRODUCTION

This information sheet has been put together to describe the main types of computer hardware currently being used in schools and colleges for the visually handicapped. It also describes the main features of the devices in question.

It is not intended to be an exhaustive list and is only a guide as to what is available and being used. Whenever possible the main supplier is included so that you can gain further information about the product. Prices should be regarded as approximations in ALL CASES. Most prices are EXCLUDING VAT and sometimes Import Duty.

This information is accurate as far as we know, but we do not accept any responsibility for inaccuracies. However, if you find any of the information to be in error, can you please let us know.

2. GENERAL ADVICE

Before purchasing any equipment you are strongly recommended to see it working. You should also use it yourself and/or get the intended user to try it out.

To obtain help you are recommended to try (in the following order):

(i) Your local L.E.A. (if possible).

(ii) The regional MEP (see APPENDIX I) or SEMERC (see APPENDIX II).

(iii) Research Centre for the Education of the Visually Handicapped.

3. WHAT IS REQUIRED FOR A COMPUTER SYSTEM

For a computer system the following devices are to be regarded as the minimal hardware configuration:

COMPUTER
TELEVISION/MONITOR
TAPE/DISC DRIVE
PRINTER (depending on intended application)

Other useful devices are listed below.

3.1 COMPUTERS USED IN EDUCATION

The main computers used in schools are:

BBC Model B
RML 380Z
RML 480Z
APPLE II
SINCLAIR Spectrum

However, it is clear that, at present, virtually the only machine which is being purchased is the BBC Model B. Thus, although the contact addresses for the other computer suppliers are included here, the extra peripherals described below will be, in the main, restricted to this model.

When purchasing computers you are strongly recommended, if possible, to do so through your L.E.A. who may be able to arrange substantial discounts. Otherwise contact the addresses below for your nearest approved dealer.

BBC Model B

Main Dealers : Acorn Computers, Cambridge. Phone (0223) 245200
Price : £399.

RML 380Z

Main Distributor : Research Machines, Oxford. Phone (0865) 249791
Price : £2,147 (including disc drives).

RML 480Z

Main Distributor : Research Machines, Oxford. Phone (0865) 249791
Price : £585 (including High Resolution Graphics).

APPLE II

Main Distributor : APPLE, Hemel Hempstead, Herts. Phone (0422) 60244
Price : £972.

SINCLAIR SPECTRUM (48K)

Main Distributor : Sinclair Research, Camberley. Phone (0276) 685311
Price : £130.

3.2 MONITORS AND TELEVISIONS

A good deal of thought should be given to the type of display used with a visually handicapped user. The main criteria for consideration being screen size, resolution of the screen, choice of colour/black and white and, of course, price.

TELEVISION

This is designed for one main purpose and that is that of a television! However, it may also be used as a display from the computer. A television is not as clear as a monitor and so it is probably not as suitable for the visually handicapped as a monitor.

MONITOR

Although clearer than a television one should note that a monitor cannot be used to receive broadcast television programs.

The resolution of a monitor is defined by the number of PIXELS that the screen can handle, the larger the number of PIXELS the greater the clarity of the screen. Do not be misled by the cheaper seeming monitors as the definition (PIXELS) may not be as great.

Monitors come in various types. The main divisions are monochrome and colour.

Monocrome

These can have either a white on black or a green on black screen. The idea behind the latter being that this is less strenuous on the eye than white on black although the contrast may not be as great for a visually handicapped user.

Colour

It has been said that the picture on the colour is not as clear as that on the monochrome and therefore not as suitable for the visually handicapped. This is fine for software that has been designed for the monochrome monitor but is inferior if colour programs are run on this type of screen as the display ends up as shades of grey which sometimes can almost be invisible. The disadvantages of this apparent loss of definition is more than offset by the variety of the colours and the fact that you can change the background and foreground colours to suit the needs of your individual student.

Costs : Monochrome £50 - £150.
Colour £300 +.

Supplier : Local Dealer (or L.E.A.).

3.3 TAPE BASED AND DISC BASED SYSTEMS

TAPE BASED - NOT RECOMMENDED

The tape based systems use a tape recorder which can be either your own home domestic one or one that has been designed to go with the system. Cassettes are of two types - those with motor control and those without.

Those with motor control can be controlled by the computer. Those without have to be turned on and off manually.

Problems - Programs take an average 3-5 minutes to load so if you are in a hurry to get started then have it ready before hand.

- Be prepared to lose at least 1 in 16 programs when you are using a tape based system.

- Be prepared for someone to erase the program that you have worked so long to perfect when you have not had time to make a backup.

- Be prepared to lose a program when it is loading if someone switches on machinery near to you. It has been known for an angle poise lamp to cause this problem.

All in all, NOT recommended.

DISC DRIVES

These are of various types, but whichever you decide to buy make sure that you can upgrade it at a later date by being able to add on more drives without having to replace the ones that you have already bought (if appropriate). In general, disc drives with their own power supply are preferable to ones which take their power from the computer.

There are 40 TRACK and 80 TRACK disc drives which are not compatible. The difference between them is basically how many tracks of information are stored on a single disc. Thus an 80 track drive holds twice as much information as a 40 track drive. Unless you expect to need a great deal of space on your disc drives then a 40 track drive is generally sufficient.

A further complication is that one can purchase a single disc drive or a twin pack. Here the recommendation is to have at least one twin disc pack in the establishment to facilitate the copying of discs etc.

3.4 PRINTERS AND EMBOSSERS

Many applications require some form of "hard copy" output to take away. The terminology which we shall use here is that print is produced by a printer and braille by an embosser.

3.4.1 PRINTERS

The main types of printer, together with their relative prices are given below. You will see printers of the same type at lower prices in some circumstances but they may well be slower and less reliable.

Daisy Wheel Printers

These machines are very similar in construction to a daisy wheel typewriter in so much as both have the petal shaped printing head which strikes the ribbon and produces the required character. This type of printer gives the best quality print for a school situation but the price is paid in terms of cost.

Speed of Printing : the order is of 25 Characters per second.

Cost : In the region of £1,000+ (you can pay £2,000+).

Dot Matrix Printer

These work on the basis of a matrix of pins which strike the paper in various combinations to provide the letter or symbol required.

They can be programmed to produce any character that you may require by running the relevant software. An extremely large variety of type faces can be reproduced by changing the print command to the printer.

Speed of Printing : the order is of 160 characters per second.

Cost : In the region of £400.

Electronic Typewriter

Some standard electronic typewriters (which may already be in your school) can be used as a printer. Here you gain the advantage of a daisy wheel printer and an electronic typewriter. In addition to the typewriter an interface to the computer is also required.

Speed of Printing : the order of 12 characters per second.

Cost : £500+ for typewriter, £150 for interface.

Spark Ink Jet

This type of printer works on the basis of 'firing' minute particles of carbon rod at a high speed through a dot matrix. There are no moving parts within the printing head itself which supposedly reduce the amount of noise and improves the reliability of the machine.

Print Quality : this is the poorest available print quality in the range of printers that will be discussed here.

Speed of Print : 83 characters per second. Several print modes.

Cost : £350

3.4.2 BRAILLE EMBOSSERS

These are devices that print out the braille cells which are sent to them on paper. They will all produce Grade I, Grade II and one of the computer brailles. However, the program on the computer will need to "know" about Grade II for this to be produced.

There are a variety of devices available - some have their own keyboard and memory, and are therefore stand alone devices, and others can only be used in conjunction with a computer.

In general, the prices below will need to have both VAT and Import Duty added to them. The delivery time on all embossers seems to be more than excessive.

The only embossers dealt with here are those which cost less than £4,000. You can pay much more for other machines if you so desire and/or require.

BRAILLO 20

Produces braille on continuous fanfold paper. Up to 40 cells per line.

Supplier : Sensory Information Systems, 10 Barley Mow Passage, London W4 4PH. Phone 01 994 6477

Cost : Approximately £3,300.

CRANMER MODIFIED PERKINS

This is basically a modified Perkins brailler which can be connected to a computer for input or output. The main disadvantage of this device is that each sheet of paper has to be loaded into the machine by hand - a la Perkins.

Supplier : Gordon Pursey, John Bradburn (Micro Systems) Ltd., St. James Mill Road, Northampton NN5 5JW. Phone 0604 55142

Cost : Approximately £2,400.

RHESUS MINI (212)

Emboss speed is 15 characters per second on continuous fanfold paper.

Supplier : Erleybridge, 2-4 Old Street, London EC1V 9AA. Phone 01 251 4452, 01 250 1928.

Cost : Approximately £3,500.

SAGEM

Will emboss on sprocket driven fanfold paper at 15 cells per second (maximum).

Supplier : Erleybridge, 2-4 Old Street, London EC1V 9AA. Phone 01 251 4452, 01 250 1928.

Cost : Approximately £3,500 with keyboard, £2,750 without keyboard.

This will apparently, we have been told, take at least six months from ordering to delivery.

3.5 ADD ON DEVICES

The following sections outline the main types of add on devices that you may be interested for purchasing for your system. These are all devices which work with the BBC micro.

3.5.1 SPEECH SYNTHESIZERS

These are of two types:

(i) Limited vocabulary - tends to be good speech quality.

(ii) Unlimited vocabulary - tends not to be as good a quality as (i) The quality of the speech can be improved by mis-spelling words. Always sounds like a Dalek.

BBC SPEECH CHIP

LIMITED VOCABULARY

This is a chip that is fitted to the computer itself. The quality of the voice is high if limited in its vocabulary. At present there are about 165 phrases.

You should be able to add further chips to give a wider vocabulary (if Acorn produce them).

It requires the upgrade 1.2 Machine Operating System.

Supplier : Local Acorn dealer.

Cost : £80 installed.

VOTRAX TYPE 'N' TALK

UNLIMITED VOCABULARY

This unit works from the RS432 port on the back of the BBC micro. It will not pronounce any punctuation.

Supplier : Cyber Robotics, 61 Ditton Walk, Cambridge BC5 8QD.

Cost : £275.

BRAID

UNLIMITED VOCABULARY

This unit works from the RS432 port on the back of the BBC micro.

Supplier : Sensory Information Systems, 10 Barley Mow Passage, London W4 4PH.

Cost : £350.

3.5.2 ROBOTICS

BBC BUGGY

This is a computer controlled vehicle with a variety of sensors. It comes with a selection of software which illustrates some applications.

Supplier : Economatics, 4 Orgrove Crescent, Dore House Industrial Estate, Hansworth, Sheffield S13 9NQ. Phone 0742 690801.

Cost : £164.35.

FLOOR TURTLE

Otherwise known as "THE TURTLE". This device is generally used with the LOGO language, a subset of which (OKLOGO) is supplied with the device.

Supplier : Jessop Accoustics, Unit 5, 7 Long Street, London EC2. Phone 01 739 3232.

Cost : £165.

3.5.3 OTHER DEVICES

CONCEPT KEYBOARD

The concept keyboard is a touch sensitive device through which the user can communicate with the computer. Total number of key areas 128.

Supplier : Star Microterminals Ltd., 22 Hyde Street, Winchester, Hampshire SO23 7DR. Phone 0962 51422.

Cost : £69 + £18 Cable.

JOYSTICKS

There are a variety of joysticks available. A fairly robust model is: Beebstick Plus.

Supplier : CLARES, 22 Townsfield Lane, Winsford, Cheshire. Phone 060 65 51374.

Cost : £39.95.

LIGHT PENS

There are quite a few of these around. If you wish to use one - go to the SEMERC and see what is available.

MICRO MIKE

This can give simple volume control over a selection of games.

Supplier : J. Tabberer, 51 Guernsey Road, Widnes, Cheshire.

Cost : £25.

MICRONET

This is the corner of PRESTEL reserved for micro users. Contact is made with PRESTEL computer via a telephone line. Hence you need a modem (to send/receive information down the line) and the appropriate software for your micro.

Supplier : Telemap Ltd., Micronet 800, Scriptor Court, 155 Farrington Road, London EC1R 3AD. Phone 01 278 3143.

Cost : £100 - £200 plus yearly subscription to MICRONET.

MODIFICATION TO PERKINS BRAILLER

This enables the computer to detect the keys pressed on the Perkins brailler.

Supplier : NEWTECH, The Coach House, Kelsterton Road, Flint, Clywd CH6 5TH. Phone 0244 816236, Ext. 29/30.

Cost : £75.

TOY CONTROL INTERFACE

Allows the use of special switches to control micro or external battery powered toys.

Supplier : MICREX, 54 Linley Road, Alsager, Stoke on Trent. Phone 0782 77270.

Cost : £29.95

4. STAND ALONE COMPUTER DEVICES

This section deals with a number of the more common stand alone computer devices, these are of two types - those which work with braille style keys and those which work with a 'standard' keyboard.

BRAILINK

This is a self-contained portable intelligent computer terminal with a braille display. The user can either type on the keyboard or use 6 of the keys to use braille input.

Supplier : Clarke & Smith Industries Ltd., Melbourne House, Wallington, Surrey. Phone 01 669 4411.

Cost : £4,800.

BRAILLE WRITER

A lightweight low cost note taking device for the blind. Feedback to the user is via synthetic speech. The writer has a standard braille keyboard; 6 braille keys, space bar plus a single multi-functional command key.

Text, when it is entered, is stored in the memory even when the machine is switched off. At any time the user can gain a print version of this Grade II braille on the internal printer. Alternatively, this can be sent to a braille embosser or computer. Grade II braille can be spoken at any time during data entry or at any time using the internal speech facilities.

Supplier : Pathway Communications Ltd., 8a St. Martin's Street, Hereford HR2 7RE. Phone 0432 53434.

Cost : £985.

ERLEYBRIDGE LIBRA

Stand alone computer for the blind.

Standard CP/M software can be run on this system.

Large character screen display.

Tactile braille display.

Instantaneous braille translation and spelling correction for braille to text and text to braille.

Speech unit integrated into the machine.

Supplied with either Perkins or Typewriter style keyboard.

Supplier : Erleybridge, 2-4 Old Street, London EC1V 9AA. Phone 01 251 4452, 01 250 1928.

Cost : £3,995 (estimated).

FRANK AUDIODATA

This is a portable microcomputer and calculator with speech output and a large print display. A most interesting feature of this device is the TASO audio scanning facility. This uses two sliders (horizontal and vertical) and an audio output to indicate the location and type of the information on the screen.

Supplier : Sensory Information Systems, 10 Barley Mow Passage, London W4 4PH. Phone 01 994 6477.

Cost : £3,100.

MARYLAND ITS

This is a self-contained computer system with highly sophisticated speech based output.

Access to standard CP/M software.

It is supplied with 3" microdrives.

Braille output is available via the Cranmer Modified Perkins (see above) from which the computer can also be controlled.

Supplier : Gordon Pursey, John Bradburn (Micro Systems) Ltd., St. James Mill Road, Northampton NN5 5JW. Phone 0604 55142.

Cost : £6,500.

MICROWRITER

This is a single handed portable note taking device.

Also available is QUINKEY which is four dummy keypads which can be connected to a single BBC micro.

Supplier : Foundation for the Communication for the Disabled, c/o Microwriter Ltd., 31 Southampton Row, London WC1B 5HJ. Phone 01 405 1019.

Cost : £299 (Microwriter), £40 for first QUINKEY keypad and £20 for each of the other three.

VERSABRAILLE

This is a self-contained braille and audio information centre.

All information is stored in the same way as a book with a table of contents, chapters, pages, and paragraphs. Information such as lectures, conversations, or songs can be as easily indexed.

Four hundred pages of braille can be stored on a C60.

Average access time is 16 seconds.

Operates on self-contained re-chargeable batteries.

OPTIONAL EXTRAS : Visual braille character display; RS232 Connector; Warrenty extension.

Supplier : Sensory Information Systems, 10 Barley Mow Passage, London W4 4PH. Phone 01 994 6477.

Cost : £5,195.

VIEWSCAN TEXT SYSTEM

This comprises of : display screen capable of presenting bright characters of selectable height up to 3" (80mm) in height; a miniature hand scanned camera for reading printed text; a compact keyboard unit which incorporates a full size typewriter keyboard, a micro cassette tape recorder that can store up to 150,000 characters, and a small printer.

Supplier : Wormald International Sensory Aids, 7 Munsters Road, West Bridgford, Nottingham NG2 7PP. Phone 0602 820600.

Cost : £4,340.

VINCENT WORKSTATION

This is a collection of (mostly) standard commercially available devices.

Cost of components of the system :

BBC Model B with Disc Interface	£410
Microline 80 Dot Matrix Printer	£280
BRAID Speech Synthesizer	£350
Single Disc Drive	£190
Perkins Brailler	£230
Perkins Interface	£100
12" Green Screen Monitor	£95
Lincoln Trolley	£95
Cables, Connectors	£50

Various alternatives to the above components are available such as colour monitor, twin disc drives, etc. For more details contact supplier.

In addition to the above prices, there is a charge of £170 for delivery, installation, and training.

Supplier : Sensory Information Systems, 10 Barley Mow Passage, London W4 4PH. Phone 01 994 6477.

5. FURTHER READING

For a more comprehensive list of computers and peripherals for the blind, you are referred to the following documents:

VOICE OUTPUT FOR COMPUTER ACCESS BY THE BLIND AND VISUALLY IMPAIRED.
Issue No. 9 and Issue No. 10, Summer and Fall, 1983.
Aids and Appliances Review, The Carrol Centre for the Blind,
770 Centre Street, Newton, MA. 02158, U.S.A.

BRAILLE AND COMPUTERS.
Issue No. 11, Winter, 1983.
Aids and Appliances Review, The Carrol Centre for the Blind,
770 Centre Street, Newton, MA. 02158, U.S.A.

INTERNATIONAL SURVEY OF AIDS FOR THE VISUALLY HANDICAPPED, J.M. Gill.
Research Unit for the Blind, Institute of Bioengineering, Brunel University, Uxbridge, Middlesex.

INFORMATION SHEET NO. 1. GETTING HELP - WHAT, WHERE, AND WHO.
Research Centre for the Education of the Visually Handicapped,
Selly Wick House, 59 Selly Wick Road, Birmingham B29 7JE.

6. INDEX

	Page
APPLE II	2
AUDIODATA (see FRANK AUDIODATA)	10
BBC Micro	2
BBC BUGGY	8
BBC SPEECH CHIP	7
BEEBSTICK PLUS (see JOYSTICK)	8
BRAID	7
BRAILINK	9
Braille Embossers (see Embossers)	6
BRAILLE WRITER	10
BRAILLO	6
BUGGY (see BBC BUGGY)	8
CONCEPT KEYBOARD	8
CRANMER Modified Perkins (see also MARYLAND SYSTEM)	6
Daisy Wheel Printers (see Printers)	5
Dot Matrix Printers (see Printers)	5
Disc Drives	4
Electronic Typewriter (see Printers)	5
Embossers	6
ERLEYBRIDGE LIBRA	10
FLOOR TURTLE	8
Floppy Discs (see Disc Drives)	4
JOYSTICK	8
ITS - INFORMATION THROUGH SPEECH (see MARYLAND SYSTEM)	11
LIBRA (see ERLEYBRIDGE LIBRA)	10
LIGHT PENS	8
MARYLAND SYSTEM	11
MICROWRITER	11
MICRO MIKE	8
MICRONET 800	9
Monitors	3
Printers	5
QUINKEY (see MICROWRITER)	11
RHESUS	6
RML 380Z	2
RML 480Z	2
SAGEM	6
SINCLAIR Spectrum	2
Spark Ink Jet Printers (see Printers)	5
SPEECH CHIP (see BBC SPEECH CHIP)	7
Tape Based Systems	4
Television	3
TOY CONTROL INTERFACE	9
TURTLE (see FLOOR TURTLE)	8
VERSABRAILLE	11
VIEWSCAN	12
VINCENT Workstation	12
VOTRAX Type 'N' Talk	7

APPENDIX I

MEP ADDRESSES

THE NORTH

Resources Centre,
Newcastle Polytechnic,
Coach Lane Campus,
Newcastle upon Tyne NE7 7XA
0632 700424
Dir: R. Edwardson.

W. & N. YORKSHIRE

Queenswood House,
Leeds Polytechnic,
Becketts Park Site,
Leeds LS6 3QS
0532 783437/8
Dir: R. Leigh.

S. YORKS. & HUMBERSIDE

Educational Development Centre,
Chequer Road,
Doncaster.
Doncaster 68935, X.53
Dir: Dr P. Avis.

E. MIDLANDS

Towers Library,
Loughborough Univ. of Technology,
Loughborough,
Leicestershire LE11 3TU
0509 37398
Dir: Dr M. Bramer.

EASTERN

Chelmer Institute of H.E.,
Victoria Road South,
Chelmsford,
Essex.
0245 354491
Dir: D. Want.

CHILTERN

Chiltern Regional Centre,
AUCBE,
Endymion Road,
Hatfield,
Herts. AL10 8AU
070 72 66121
Dir: Dr B. Tagg.

SOUTHERN COUNTIES

Southern Regional Microelectronics
Information Centre,
Furnace Drive,
Furnace Green,
Crawley RH10 6JB
0293 546216
Dir: P. Neate.

SOUTH WEST

Bristol Polytechnic,
Coldharbour Lane,
Frenchay,
Bristol BS16 1QY
0272 656261
Dir: R. Margetts.

CAPITAL

ILEA Education Computer Centre,
Bethwin Road,
London SE5 0PQ
01 735 1895
Dir: M. Doran.

WALES

Welsh Joint Education Committee,
4th Floor, Arlbee House,
Greyfriars Road,
Cardiff CF1 3AE
0222 25511.

W. MIDLANDS

MACE,
Four Dwellings School,
Dwellings Lane,
Quinton,
Birmingham B32 1RJ
021 421 6361
Dir: R. Conibear.

MERSEYSIDE WITH CHESHIRE

Regional Information Centre,
Rodney House,
70 Mount Pleasant,
Liverpool L3 5UX
051 708 6620, X.27
Dir: Mrs. S. Evans.

G. MANCHESTER & LANCS.

Manchester Polytechnic,
Didsbury School of Education,
799 Wilmslow Road,
Manchester M20 8RR
061 445 0780
Dir: R. Chantry-Price.

N. IRELAND

MICRONET Centre,
South Building,
New Univ. of Ulster,
Coleraine,
N. Ireland.
0265 4141, X.341.
Dir: H. McMahon.

APPENDIX II

SEMERC ADDRESSES

NEWCASTLE

Newcastle Polytechnic,
Coach Lane Campus,
Newcastle upon Tyne NE7 7XA
0632 665057.
Manager: Colin Richards.

MANCHESTER

Manchester College of H.E.,
Hathersage Road,
Manchester M13 0JA
061 225 9054
Manager: Bob Dyke.

REDBRIDGE

Dane Centre,
Melbourne Road,
Ilford,
Essex.
01 478 6363.
Manager: Mrs. Jean Tait.

BRISTOL

Faculty of Education,
Bristol Polytechnic,
Redland Hill,
Bristol BS6 6UZ
0272 7412151, X.52.

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 3

SOME GUIDELINES FOR MANAGING THE MICRO IN SCHOOL

PAUL BLENKHORN

JUNE, 1984

RESEARCH CENTRE FOR THE EDUCATION
OF THE VISUALLY HANDICAPPED

FACULTY OF EDUCATION

UNIVERSITY OF BIRMINGHAM

SOME GUIDELINES FOR MANAGING THE MICRO IN SCHOOL

INTRODUCTION

Over the past eight months, I have been to visit many of the schools for the visually handicapped in England, and have thus gleaned some of the ways in which the micro-computer is being used successfully in those schools. This information sheet taps both that experience and previous experiences in using micro-computers. It has been written with the intention of giving some ideas and helpful hints on the management of this resource. Not all of the details will apply to all schools but such is the nature of this type of document. Most of the section on hardware management is purely common-sense, but software management is an area which often has too little thought given to it.

HARDWARE MANAGEMENT

In an ideal situation, a computer will be available to all those who require it. However, in the real world this is not always the case. Many schools have only one (or two) computers and they may be kept permanently in a particular room. If the layout of the building permits, then having your computer system on a trolley may help. This can then be moved, as required, from place to place. This does, of course, make the system much more portable for any thieves who may be around! If possible, all the cables should be tucked away with only a single socket to plug into the wall. Consideration should be given to placing braille labels on all switches for ON/OFF etc. As many schools are residential, and some children seem to be ever willing to use the computer, the trolley may permit the computer to be moved to a different place in the evenings so that it can be used for recreational/educational software. It should be noted that many trolleys have been designed for adults. As an incorrect body posture is not to be desired, some care should be taken in choosing a trolley which makes the use of the computer as comfortable as possible.

The biggest problem in this area seems to be in deciding on the physical layout of the computer system. If using a screen (and visually handicapped) then the child (or children, if using the program with a group) should be able to have easy access to both the screen and the input device to the computer (keyboard, concept keyboard, joystick, Perkins, etc.) without having to practise yoga at the same time! At present, I have no solution but to move around the hardware as required.

SOFTWARE MANAGEMENT (DISC MANAGEMENT)

The major problem in this area is that you may not realise the consequences of poor management until it is too late. Three scenarious should help to make the point:

(i) You come to run one of your prized programs (it may have taken you several hours to type it in or several weeks to get it through the post). First of all you can't find the discs because you lent them to one of your fifth-formers. When you finally track it down you find that the disc has somehow become corrupted. As you did not have another copy of the disc, up to 32 programs have been lost.

(ii) Unbeknown to you, the disc drive on your computer has thrown a wobbler! Whenever you insert a disc into it, the disc is immediately corrupted. Not really understanding what is going on, you try disc after disc in the drive "knowing" that they worked yesterday. Eventually all the discs become corrupted!

(iii) The week before the final exams for the fifth year computer studies group, John comes to see you about his program which he's been working on all year. His disc is corrupted! All his programming is lost! What do you do?

The above are all somewhat extreme examples of what can go wrong. (They really can, if somewhat rarely.) More common mistakes such as backing up one disc onto another, saving a new program with the same name as an old one, and various others - most of which, I hasten to add, I have done at one time or another. In general, a good deal of care should be taken with discs. Many schools do not allow smoking, eating or drinking near the computer. The discs should be stored in a cool place away from sunlight, radiators and any magnetic fields.

WHAT TO DO WITH YOUR DISCS

I strongly suggest that the following system, or something like it, should be adopted:

(a) For Existing Software
Three copies of every disc should be made (at least). The first disc should be labelled WORKING DISC and will be the only one used with the computer. A second copy should be labelled BACKUP DISC and should be kept away from the computer. This is only ever used for making further WORKING DISCS. The third copy should be labelled MASTER COPY. This will be kept in a totally separate location (in case of fire, theft, etc.) and should NEVER be used. All discs should be write-protected* except for the WORKING DISCS which write to the disc (R.C.E.V.H. discs come under this category). It is sensible to keep software of a similar type, e.g. third-year maths programs, on a separate disc. Although you may not fill every disc it should make finding and using software easier, as will a suitable indexing system for both disc and the associated documentation.

(b) When Developing Programs
The rules that I follow are to back up programs which I am working on every few hours, and again at the end of the day. For students, the equivalent of this will probably be to back up once a week. Having one disc per student is NOT sufficient as they should back up their programs onto a separate disc. NEVER put a back-up disc (or a MASTER disc!) on to your disc drive if you are in any doubt about the functioning of your disc drives.

If one must use cassettes then all of the above guidelines for discs apply to the management of cassettes. In addition, each tape should always be used with a particular cassette machine and be labelled accordingly.

If possible, each school should try to produce some guidelines for the particular systems being used there and although these guidelines may mean more work for some, the points raised are important. It is too late if you learn by your mistakes!

*To write-protect a 5¼" floppy disc, you cover up the notch on the side of the disc with one of the small sticky labels which should have come with the disc.

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 4

COMPUTER BRAILLE CODE

PAUL BLENKHORN and TOM MALEY

1985

RESEARCH CENTRE FOR THE EDUCATION
OF THE VISUALLY HANDICAPPED
FACULTY OF EDUCATION
UNIVERSITY OF BIRMINGHAM

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 4

COMPUTER BRAILLE CODE

Produced by Paul Blenkhorn and Tom Maley for the Communication Aids Working Party

This information sheet has been produced to describe what is meant by Computer Braille and why there is a need for an alternative code to either Grade I or Grade II Standard English Braille. It is intended for teachers who may be starting to teach programming to blind children in schools and who may be starting to connect devices which use braille to computers. This information sheet will assume that the reader is familiar with Grade I and Grade II Standard English Braille.

So, why do we need another braille code? Standard braille is not at all ambiguous in its representation of lines of text such as:

"Good morning," he said, "how are you?".

But consider a line from a computer program such as:

```
20PRINT"PRx21="+STR$(X1/P)+" OK.?"
```

It is not at all clear how to transcribe this in an unambiguous way, and, when programming, one must know precisely the information which is held by the computer - character for character. Symbols which are commonly used in computer code, although they can be represented in Grade II Braille, are context dependent, for example, the characters: ', $, %.

A similar requirement is to enable different devices which use braille such as computers, embossers, Versabraille, and Braillink to communicate. Each braille cell will have a particular character (which you can think of as being on a typewriter keyboard) associated with it. This means, of course, that the numbers 0-9 cannot now be represented in computer braille by A-J as that is now ambiguous - we cannot use the numeral sign being on a character-for-character basis. The definition of how each braille cell is represented as a single character is called a "Computer Braille Code". Unfortunately, there is not a single universal computer braille code, and the different devices, such as embossers, Braillink, and Versabraille, do use different codes. In the main, though, the field is (almost) covered by the North American Six-Dot Braille Computer Code (see Appendix I) and the British Six-Dot Braille Computer Code (see Appendix II). You will see that these two codes are consistent as far as the letters A-Z are concerned, but differ in their representation of most of the other cells.

If a child is using a device, such as Versabraille, for programming, then he/she will need to be taught the appropriate computer braille. However, there is a British Standard agreed by the Braille Authority of the U.K. and, if possible, this should be followed. (The British Computer Association of the Blind is represented on the Authority and played a key role in the formation of the codes.)

Problems with Computer Braille

Although designed to give the user a direct braille representation of the information in text, there are still only 64 possibilities for the braille cell. There are many more characters than this on a computer and so some translation, such as lower case letters to upper case letters, is often carried out by the braille device without the users being necessarily aware of it. You may thus consider it sensible to work just in upper case. To get round this problem, some devices use an eight-dot braille cell which can then represent all characters possible on most computers. However, the eight-dot cell has no generally agreed British standard and is not dealt with in any more detail here.

It should be made clear that the character-for-character codes which have been discussed here are relevant for communication between computers and other devices. The limitations of braille to 64 characters does not mean that computer code in the widest sense cannot be represented in computer text books as:

(i) symbols beyond the 64 characters set;

(ii) commonly used graphics symbols; and

(iii) new symbols, possibly specific to a particular text book;

are all allowed although this may need several characters to give an unambiguous definition. For further details on this point, please contact Tom Maley at the R.N.I.B., Braille House.

APPENDIX I

U.S. COMPUTER BRAILLE

Character	Braille	Character	Braille	Character	Braille
@		U		+	
A		V		,	
B		W		-	
C		X		.	
D		Y		/	
E		Z		0	
F		[		1	
G		\		2	
H		]		3	
I		^		4	
J		SP		5	
K		!		6	
L		"		7	
M		#		8	
N		$		9	
O		%		:	
P		&		;	
Q		'		<	
R		(		=	
S		)		>	
T		*		?	
		_			

APPENDIX II

U.K. COMPUTER BRAILLE

Character	Braille	Character	Braille	Character	Braille
1		L		+	
2		M		=	
3		N		<	
4		O		>	
5		P		*	
6		Q		/	
7		R		-	
8		S		$	
9		T		%	
0		U		@	
A		V		#	
B		W		[	
C		X		]	
D		Y		'	
E		Z		(	
F		&		)	
G		,		\	
H		;		↑	
I		:		!	
J		.		←	
K		?		"	

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 5

VERSABRAILLE

PRODUCED FOR THE

COMMUNICATION AIDS WORKING PARTY

SUSAN SIMMONS, TOM MALEY,

PAUL BLENKHORN, BRIAN PAYNE.

JUNE, 1985

RESEARCH CENTRE FOR THE EDUCATION

OF THE VISUALLY HANDICAPPED

FACULTY OF EDUCATION

UNIVERSITY OF BIRMINGHAM

The University of Birmingham

RESEARCH CENTRE FOR THE EDUCATION OF THE VISUALLY HANDICAPPED,
FACULTY OF EDUCATION,
DEPARTMENT OF SPECIAL EDUCATION,
Selly Wick House, 59 Selly Wick Road, Birmingham B29 7JF
Telephone 021-471 1303

Director and Theodore Tylor Lecturer: Dr. M. J. Tobin

Dear Reader,

This information sheet is one of several being produced by the Communication Aids Working Party. The aim of these documents is to provide details of particular devices and their potential application in the education of the visually handicapped. The sheets are being written by experienced users and are based on current knowledge of their use in schools. The group are anxious to share their experience of these devices and to stimulate further and more comprehensive evaluation. In this context, the views expressed are not necessarily those held by either the Research Centre or the Working Party as a whole.

We would like to encourage all comments, suggestions, and criticisms regarding these information sheets.

Yours sincerely,

Eamonn Fetton,

Paul Blenkhorn.

INFORMATION SHEET NO. 5

VERSABRAILLE

(A) INTRODUCTION

The purpose of these notes is to give an overview of the use of the Versabraille in education. The facts included have been obtained from answers to the questionnaire distributed in June, 1984, discussions with users, and direct experience.

(B) GENERAL DESCRIPTION

One user has described the Versabraille as a "portable computer for the blind". People who use braille as their means of written communication can use it as an effective word processor. It weighs approximately 10 pounds and measures 9.25 by 14 by 4.5 inches. The source of power is from mains supply or the rechargeable nicad batteries (charging time is approximately 14 hours and charge is held from 2 to 3.5 hours depending on type of use). The Versabraille has a "Perkins" type keyboard and braille is instantly displayed on a 20 character reading line. Running along the top of this line is the advance bar which is tapped lightly to progress through text. The Versabraille can also be used as an audio tape-recorder/play-back machine.

Volume 1 of the Owner's Manual gives instructions for using the Versabraille as a stand-alone device. The use of the function keys for both tape and memory manipulation are clearly explained. Volume 2 of the Owner's Manual deals with the machine's use when connected to external devices. The Versabraille has an RS 232 interface that will connect to a great number of computers, embossers, printers and other devices including telephone services such as Prestel or Telecom Gold (electronic mail) and used as a modem for amateur radio purposes (see Appendix II). Grade 1 or Grade 2 braille can be written but if a text print-out is required, when writing in Grade 2, the Versabraille must be interfaced with a computer and translation programs used (see Appendix I). Material is stored on a good quality C60 cassette specially formatted for the purpose. It is essential to use ferric tapes - not chrome, chrome dioxide, or metal tapes. Formatting splits up the tape into 200, 1,000 character pages on each side of the cassette. It should be noted that Versabraille is a very expensive system. The price, as at March, 1985, was $7,500. A separate external charger costs approximately $250. The manufacturer, Telesensory Systems, supply the Owner's Manual, in print and braille, sample pages of tape, a tape for cleaning the heads, and a blank tape. Warranty is for one year.

(C) USER SKILLS

Success, and effectiveness of use, depend to a great extent upon individual attitude and motivation. Sensitivity of touch is a requirement as the keys and advance bar respond to light touch. It is advisable to borrow a Versabraille for a reasonable trial period before purchasing. The Royal National Institute for the Blind have a number of machines for this purpose. To discover the full potential of the machine the user should use it as frequently as possible, experiment with it, and contact other users.

(D) SUITABILITY TO EDUCATIONAL ENVIRONMENT

(i) Portability

The size and weight of the Versabraille enable it to be transported easily using the comfortable handle attached to the main body of the machine. Because written material is stored on tape, it is unnecessary to carry heavy volumes of text. However, because of the short time that the battery will hold its charge it is often necessary to carry the charger which weighs approximately 4 pounds. Solutions that have been suggested are: use a rucksack or light strong bag with a shoulder strap; have a charger at home and at work. In one school a purpose-built trolley has proved invaluable for moving a micro-computer, printer, and Versabraille. Frequent dismantling and re-assembling is avoided and the trolley can be wheeled into a safe for storage.

(ii) Reliability and Durability

Reports on this aspect of the Versabraille vary considerably. In some cases no repairs have been necessary, in others a fault has recurred and the machine has been out of action several times. This has caused problems. There is good, prompt, customer support but repair can take a week or longer. One solution would be to be able to borrow another Versabraille during the repair period. Important notes and files can be accessed if copy is always kept on computer disc as well as on the Versabraille tape, although an alternative means of obtaining hardcopy would be required, for example, an embosser or modified Perkins.

(iii) Noise

The Versabraille is suitable for working in an environment where noise level is a consideration. It is quieter to operate than a Perkins or typewriter, and the volume of the sound bleeps can be controlled.

(iv) Student Use

Each machine should be designated for the use of one individual. Through using a Versabraille students have control over their own text. Mistakes can be altered with characters and words deleted or inserted. The desirable habit of checking work becomes meaningful and can be fostered from an early stage. Alphabetical listing for vocabularies and files is possible. Through the retrieval system, chapters and the top of pages within these can be easily accessed and then a paragraph or word on that page can be located. Because of its quiet operation the Versabraille is suitable for note-taking. Its size means that it can be used when working surface space is limited, for practical subjects which require other apparatus. The facility of interfacing with other equipment means that written work can be completed and examinations undertaken without sighted transcribers. A program written at the Research Centre for the Education of the Visually Handicapped enables the user to independently carry out the entire process of transmitting Grade 2 braille through the BBC computer, formatting it, and obtaining a text print-out. Another program enables the user to select pages of TELETEXT (i.e. CEEFAX and ORACLE) and read the information available in Grade 2 braille. Devices used to complement the Versabraille are the Perkins, Optacon, and tape-recorders. Column layouts are difficult to obtain using the Versabraille and for subjects like statistics, mathematics, and science, this may not be the most suitable machine. Other disadvantages are: if power fails new material is lost, although previously stored material is retained; there is no warning to indicate that the battery charge is low; to reach the bottom of a page the advance bar must be used; there is no word count; there is no word search across page boundaries; the tape must be re-wound each time the Versabraille is switched off. As a tape-recorder, the indexing facility is useful but the quality of the sound has been criticised. The counter can be heard in the background.

(v) Teacher Use

Use of the different functions of the Versabraille can be introduced gradually. The student needs plenty of time to firstly adapt to the light touch required to operate the machine and to eventually discover its immense potential. At first the teacher can select the new chapter and the pupil can concentrate on writing and reading back material and practice moving both hands from the writing keys to the reading line without unintentionally pressing the advance bar. Natural curiosity seem the best motivating factor for introducing new features but again it should be emphasised that it is continuous use and experimentation with guidance, when necessary, that produces an efficient, satisfied Versabraille user. The manuals contain examples and directions which are easy to follow for becoming acquainted with the machine and the pupil should be referred to the relevant sections as well as receiving practical teaching. Immediate advice and help is willingly offered by the personnel at T.S.I. The translation programs under development at the Research Centre can be used without knowledge of the technical aspects of the Versabraille or computer. Work in print can be prepared on disc and from the same source, with few alterations, a braille output can be obtained. This includes work sheets which require words or answers to be inserted. As a student is working, a visual print display can be checked on a V.D.U.

(E) CONCLUSION

The Versabraille is a personal piece of equipment. As a means of communication in education its full potential can only be realised through continuous individual use, experimentation, and contact with other users. Direct contact between experienced users and those learning is important. Teaching should take place through 'hands on' experience. A list of users and the equipment with which they have successfully interfaced the Versabraille is available through Cross Talk, a document obtainable from T.S.I. One respondent to the questionnaire asked "Why should not all books be on cassette?". Users are requesting dictionaries and reference books, as well as fiction books. The R.N.I.B. is starting to develop Versabraille books. To avoid duplicating material, a co-ordinated organisation is needed for the production of Versabraille tapes so that there can be an interchange between different educational establishments and availability is communicated to all users. Future developments will include translation programs for languages.

Other subjects that require consideration because of their special codes are music, mathematics, and science. Some work is already being under taken for these subjects. Leaflets giving details of 'how to interface the Versabraille' with defined pieces of equipment, 'method of use', and contact names, addresses, and telephone numbers, will serve to spread knowledge. No one aid is sufficient for all work in education but it can be claimed that the Versabraille fulfils many roles, and from the evidence received from users, in spite of some limitations, it is an invaluable piece of equipment.

APPENDIX I

SOURCES OF INFORMATION

(1) Telesensory Systems, Inc., T.S.I.,
2B England's Lane,
London,
NW3 4TG
Tele: 01 586 4128

Owner's manuals, technical details, repairs and servicing facilities.

(2) Research Centre for the Education of the Visually Handicapped,
Selly Wick House,
59 Selly Wick Road,
Birmingham,
B29 7JE
Tele: 021 471 1303

Translation programs.

(3) Reference Library,
Braille House,
338 Cromwell Road,
London,
EC1V 7JE
Tele: 01 837 9921

(a) Review of the Versabraille by Sue Melrose.

(b) User's Versabraille system experiences by J. Beard (July, 1983).

(4) Brunel University,
Kingston Lane,
Hillingdon.

APPENDIX II

(1) Wiring for cable

(a) BBC Model B Computer
With 13 pins at the top the earth braid is on pin 7, green on pin 9, blue on pin 11, clear on 13. On the bottom row, yellow on 6.

(b) Sartorius balance
Ensure plugs are correct genders. Pin numbering - balance to VB, 2 to 3, 3 to 2, 14 to 7.

(2) CCPs and other necessary information

(a) BBC Model B Computer
Use master tape supplied by T.S.I. load terminal. Set CCPs as follows:

B at 300
D at 8
P at N
S at 2
T at C (not on D model - set VB to American braille)
LL at 80
PL at 0
CI at Y
CR at 0
ET at EOT
DX at H
HS at DTR
AI at N
CO at CR
AK at Y
DCI at N
CTS at Y (not available on B model)
CD at N
Chord R,R for receiving material from the computer
Chord R,I for inputting material to the computer from VB.

(b) Sartorium balance

B at 1200
D at 7
P at O
S at 1
T at C
DX at F
HS at DTR
AI at N
CO at CRLF
AK at N
DCI at N
CTS at N
CD at N
Other settings at default
Chord R,R
On the Versabraille, type control escape (Dot 4, ON, P).

COMPUTER ASSISTED LEARNING FOR THE V.H.

INFORMATION SHEET NO. 6

MICROWRITER

PRODUCED FOR THE

COMMUNICATION AIDS WORKING PARTY

Eamon Fetton

AUGUST, 1985

RESEARCH CENTRE FOR THE EDUCATION

OF THE VISUALLY HANDICAPPED

FACULTY OF EDUCATION

UNIVERSITY OF BIRMINGHAM

The University of Birmingham

RESEARCH CENTRE FOR THE EDUCATION OF THE VISUALLY HANDICAPPED,
FACULTY OF EDUCATION,
DEPARTMENT OF SPECIAL EDUCATION,
Selly Wick House, 59 Selly Wick Road, Birmingham B29 7JE
Telephone 021-471 1303

Director and Reader in Special Education: Dr M. J. Tobin.

Dear Reader,

This information sheet is one of several being produced by the Communication Aids Working Party. The aim of these documents is to provide details of particular devices and their potential application in the education of the visually handicapped. The sheets are being written by experienced users and are based on current knowledge of their use in schools. The group is anxious to share their experience of these devices and to stimulate further and more comprehensive evaluation. In this context, the views expressed are not necessarily those held by either the Research Centre or the Working Party as a whole.

We would like to encourage all comments, suggestions, and criticisms regarding these information sheets.

Yours sincerely,

Paul Blenkhorn,
Research Fellow.

Supported under the Sir Theodore Tylor Memorial Fund by the
ROYAL NATIONAL INSTITUTE FOR THE BLIND
224 Great Portland Street, London, WIN 6AA

MICROWRITER

CONTENTS

(1) INTRODUCTION 1

(2) THE MICROWRITER 1

(a) General Description 1
(b) Models, Programs, and Modifications 1
(c) Dummy Keyboards 2
(d) Reliability and Servicing 2
(e) The Microwriter in Perspective 2

(3) THE MICROWRITER AS A WORD PROCESSOR 3

(a) Principles of Operation 3
(b) Character Set 3
(c) Memory Access Facilities 3
(d) Formatting Facilities 3
(e) Editing Facilities 4

(4) PERIPHERAL DEVICES 4

(a) Interfacing 4
(b) Display Screen Adaptor (DSA) 4
(c) Cassette and Microcassette Storage 4
(d) Printers 5
(e) Braille Embossers 5
(f) Speech Synthesizers 5
(g) Microcomputers 6
(h) Soft Braille Devices 7
(i) Reading Aids 7

(5) LEARNING AND TEACHING 8

(a) Self-tuition 8
(b) Teaching Microwriting 9
(c) Applications in Education 11

(6) SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS 11

(a) The Microwriter System 11
(b) Peripheral Devices 11
(c) Learning and Teaching 12
(d) The Microwriter in Perspective 13

APPENDIX I 14

Information Sheets Available from the Foundation 14

(1) INTRODUCTION

The purpose of this information sheet is to consider the potential application of the Microwriter as a communication aid in the education of the visually impaired. Though primarily marketed as a piece of business hardware, it was recognized that it may meet the needs of some disabled people.

The Foundation for Communication for the Disabled was established to modify and distribute systems to these users. Amongst the visually impaired the Microwriter has had a mixed reception and there is considerable uncertainty as to whether or not it is valuable in the context of education. In 1983 the Royal National Institute for the Blind and the Department of Trade and Industry set up a project whereby 50 systems were distributed for trial by a variety of users in education and employment. This information sheet is based closely on the recently published report on the project, which is available from the R.N.I.B. There is, however, no irrefutable evidence on which to draw conclusions. The objective here, therefore, is to outline the full range of facilities which the Microwriter, in conjunction with other devices, may offer and to raise some of the issues on which an evaluation might be based.

(2) THE MICROWRITER

(a) General Description

Used in conjunction with a range of other computerised devices, the Microwriter can be seen as a multi-media information storage and retrieval system. It is 4" wide, 8.5" long, and 2.25" high, and operates on a rechargeable battery. Hence one of its main benefits is portability. Using a five-finger keyboard the user can write a full range of symbols which are stored on an internal non-volatile memory with a capacity of 8k characters (approximately three/four A4 typed sheets). A 12 character LED (Mark III) or 16 character LED (Mark IV) display provides verification while writing, and review of the material stored in memory. Interfaced to other equipment the contents of the memory can be displayed on a VDU, stored on cassette or computer disc and output in hardcopy print, hardcopy braille, soft braille or synthetic speech.

(b) Models, Programs, and Modifications

At present, there are two models, the Mark III (white with red-on-black LED display) and the Mark IV (brown with LCD display). Furthermore, there are a number of different 'program chips' available for the Mark III. It is important to note that the scope of control over peripherals varies from one model to another - this is particularly true with regard to speech synthesizers. In summary, the Mark IV is the newer model and is more versatile and reliable. Unfortunately, due to the colour and angle of the display it cannot be read by many visually impaired users able to read the Mark III display. While there is a commitment to maintain the older model, this does not extend to development.

The Microwriter is primarily a piece of office equipment commercially marketed. The Foundation for Communication for the Disabled is a registered charity established to modify and distribute Microwriters to disabled users. A number of modifications have been made to the standard Microwriter to meet the needs of variously disabled people. These include a left-handed model, stiff keyboard, re-arranged keys, remote display, scanning version and sequential version. As yet no modifications have been made to meet the particular needs of the visually impaired but the development of an alternative display for the Mark IV, incorporated or as an add-on, is a modification which would undoubtedly determine the relevance of the Microwriter as an aid for many, both in education and employment.

(c) Dummy Keyboards

Microwriter cases with keys but without memory or display can be connected to a microcomputer to serve as an alternative to the QWERTY keyboard. These are available at a fraction of the cost of a Microwriter and up to four can be connected to a computer at one time. As an alternative keyboard its greatest benefits are probably in the area of physical handicap. In addition, they may be used for group work or for initial learning of the code.

(d) Reliability and Servicing

A clear distinction must be made between the Mark III and Mark IV models. With the exception of some difficulties experienced with the cassette storage system, evidence suggests that the Mark IV is generally considered to be a reliable machine. Quite the reverse is true of the Mark III. Mark III users give evidence of a wide variety of problems including:

(i) intermittent failure of the device to work when switched on; this was sometimes overcome by switching on and off numerous times;

(ii) failure to hold charge;

(iii) loss of memory;

(iv) memory corruption;

(v) appearance on the display of characters not entered;

(vi) difficulties in saving and retrieving files from cassette;

(vii) corruption of menu default values leading to difficulties in printing hardcopy;

(viii) difficulties in interfacing with other processing devices;

(ix) jamming of the system while writing.

Clearly, since there is no commitment to service or development, investment in the Mark III is not advisable. Unless the Mark IV display can be suitably modified, or an alternative portable display produced, Mark III users will almost certainly have to abandon the system.

(e) The Microwriter in Perspective

Communication can take place through visual, auditory and tactile media. Developments in microelectronics in recent years have facilitated media interchange and multi-media systems. Microwriting is an example of such a system. Information is input by means of a one-handed keyboard, stored on an internal chip or external disc or cassette, and output in audio form through a speech synthesizer, in tactile form through embossers or soft braille devices and in a variety of visual media including hardcopy print, VDU and LCD displays. Such facilities are revolutionising the communication methods of the visually impaired. The crucial factor is that once information has been input to some form of computing device, it can then be transmitted to other devices thus resulting in a variety of output.

In reading the following chapters it is important to bear in mind that many of the facilities discussed, particularly in relation to peripheral devices, are not exclusive to the Microwriter but are simply due to the general ability of computer aids to communicate with each other. Similarly it is important to note that not all the effects that can be achieved are necessarily useful. Above all it must be recognised that the Microwriter is just one of a whole range of multi-media systems which should be considered. For some users a Versabraille, microcomputer or portable computer may be more appropriate.

(3) THE MICROWRITER AS A WORD PROCESSOR

(a) Principles of Operation

The Microwriter keyboard contains six keys but only five are used to form characters. The sixth key is known as the 'command' key and its functions are similar to those of the control key on a microcomputer. Unlike most other writing devices, the Microwriter is operated by only one hand. Each of the five keys used to form characters can be either on or off and so there are 32 possible combinations as shown in Figure 1.

Figure 1. Binary Representation of Key Combinations

00000	00001	00010	00011	00100	00101	00110	00111
01000	01001	01010	01011	01100	01101	01110	01111
10000	10001	10010	10011	10100	10101	10110	10111
11000	11001	11010	11011	11100	11101	11110	11111

(b) Character Set

The first combination shown in Figure 1 shows all switches off and so no character is produced. By introducing the sixth key it is possible to switch the Microwriter into one of four different modes, each offering 31 characters. Some of the combinations in the fourth setting are control functions rather than characters (e.g. underline on/off switch), and some produce symbols which cannot be produced on all printers. A limited number of combinations produce the same character in each setting. On the Microwriter display special symbols appear to indicate the mode. The display cannot produce all of the characters which can be printed. On the Mark III display, for example, all letters appear as capitals but those which have been keyed in as capitals also flash.

(c) Memory Access Facilities

Key combinations incorporating the command key provide the following access facilities:

Read forwards - one character
continuous slow
continuous at speed

Read backwards - one character
continuous slow
continuous at speed

Zip forward to - next line
next paragraph
end of document
end of memory

Jump back to - previous line
previous paragraph
beginning of document
beginning of memory

(d) Formatting Facilities

The following items can be varied but there are some differences between the Mark III and Mark IV:

Margins
Tabulation
Line length
Page Length
Print pitch
Line spacing

(e) Editing Facilities

The following facilities are available:

Over-write
Insert
Delete

(4) PERIPHERAL DEVICES

(a) Interfacing

Reference has already been made to the importance of communication between devices and to the fact that the Microwriter only becomes a viable communication aid when forming part of a more comprehensive system. For some users connection to a printer, cassette recorder and VDU is adequate but for others, systems will incorporate more unusual and complex devices. In this chapter we will consider the benefits arising from connection to a large range of devices which may be of use to the visually impaired.

The Microwriter incorporates an RS232C communications system and in principle, therefore, can communicate with all other RS232 devices. The Mark III model requires an EIA RS232C interface while the Mark IV requires only a correctly wired lead with a 25-way D-type plug at the Microwriter end. Both models operate in a similar manner but in general, links can be established more easily and reliably with the Mark IV. It is advisable to contact Microwriter Limited or the Foundation if trying to establish a link.

(b) Display Screen Adaptor (DSA)

By means of a DSA it is possible to display the contents of the Microwriter memory on a domestic TV or video monitor. This system is ideal for checking format and for editing. Depending on convenience the Microwriter can be connected to the monitor while preparing documents or simply for editing. Evidence contained in an unpublished report of a trial project undertaken by a government department also confirms that editing by means of the Microwriter display alone is inadequate and thus efficient use requires editing by means of a VDU. A further problem in the case of the visually impaired is that the DSA system produces a 64-column screen display which is comparatively small. This problem may, to some extent, be alleviated by the use of 30" monitors. Even if the system could be adapted to produce large-character displays, such a solution would preserve some editing advantages but would, of course, preclude true format since one print line would have to scroll to at least a second screen line. This would be particularly important where layout and tabulation facilities were in use. Connection to a microcomputer may be one solution, and this will be discussed later in this chapter. For the moment it is sufficient to say that for those not using speech synthesizers or soft braille devices, a means other than the Microwriter display is essential for efficient editing.

(c) Cassette and Microcassette Storage

The contents of the Microwriter memory can be stored on cassette and retrieved later for editing or printing. Since storage is sequential, rather than random, access to stored files is time-consuming. It is, however, cheap and highly portable, especially when using microcassette recorders. In principle links can be established between both Microwriter models and most cassette recorders. In practice, however, many difficulties can arise and many cassette models have proved unsatisfactory. For this reason it is highly advisable to seek advice from Microwriter Limited or from the Foundation. Of the various facilities offered by different machines, a tape counter is

especially useful since it permits catalogueing of stored files and thus aids efficient retrieval. Though economic and useful, the cassette is not particularly efficient in applications where lengthy documents or large numbers of documents require storage and retrieval. In such situations, access to disc storage is highly desirable.

(d) Printers

The Microwriter can be interfaced to most dot-matrix or daisy wheel printers. It should be noted however, that some Mark III models transmit data in serial form only, while some printers receive data in parallel form only, and thus a link cannot be made. It may be possible to overcome this problem by having the printer upgraded to receive data in both serial and parallel form.

(e) Braille Embossers

There are a variety of embossers now available and the Microwriter can be interfaced to these in the same way as to ordinary printers. Obviously formatting instructions would have to be altered accordingly. Printing direct from the Microwriter, however, produces only Grade I braille, and print characters without single-cell representation in braille will be output in the embossers version of computer braille. This is of very little benefit to the majority of braille readers. A more satisfactory method would be to dump the contents of the Microwriter memory to a microcomputer, put the text through a transcription program and send it to the embosser from the computer. Very often, however, such programs are only available as part of hard and software packages at very considerable cost. Fortunately such a program (written for the BBC Model B micro) is now at an advanced state of development at the Research Centre for the Education of the Visually Handicapped, University of Birmingham. In education it is essential that the pupil/student has an efficient means of storage and access to notes and essays. Similarly in some employment situations easy reference to reports and correspondence may be necessary. The cassette storage system is not suited to this purpose. Hardcopy is one alternative which would be favoured by many. Another may be disc storage on a microcomputer with speech output or on a soft braille terminal.

(f) Speech Synthesizers

There are essentially two types of speech synthesizer, those with a preset vocabulary and those with an infinite vocabulary. Since microwriting is likely to entail producing texts of various kinds the latter type are necessary. Used with a Mark IV this device offers a wide range of options. Text can be spoken as it is being written or accessed later in a variety of ways including character by character, word by word, or continuously. The Mark III model operates synthesizers in print mode only. The command to 'print' is keyed in and the contents of memory are spoken out continuously. Editing would therefore be impossible and thus synthesizers are not a particularly useful peripheral when used with the Mark III. It should be noted, however, that synthesizer users would not be using the display and so would not need a Mark III. Appreciation of format is necessarily abstract and editing less efficient than by visual means. Some users, while finding speech strange at first, became accustomed to the voice and appreciative of the fact that it facilitated an independent means of writing and verifying printed text. Those who master the system generally rarely prepare documents when connected to the synthesizer since this slows down the process of writing. Editing is therefore its principal function.

(g) Microcomputers

The Microwriter can be linked to microcomputers by means of the RS232 interface. The necessary software has been written for both the RML 380Z and BBC Model B. It should be noted that the Mark III and Mark IV models require different connections and software and both Microwriter Limited and the Foundation are able to offer much more support in developments with the latter. A successful link to either microcomputers or to business word processors and computer terminals present many worthwhile possibilities:

(i) Replacement of QWERTY keyboard : this facility may be particularly beneficial where a user has mastered Microwriting but is not a trained QWERTY user. As will be seen later, the former is acquired much more quickly although the speeds generally achieved are considerably slower. Braille users may also wish to copy from hard-copy braille using one hand to read and the other to Microwrite.

(ii) Further processing and disc storage : files prepared on the Microwriter can be dumped to a more sophisticated word processor for further editing and formatting, and be stored on disc for rapid retrieval. Portability is one of the Microwriter's most important attributes and it is especially useful as a means of recording the proceedings of meetings, writing reports away from the office, preparing homework or writing letters and notes while in transit. Evidence also indicates clearly that people skilled in both typing and Microwriting achieve higher speeds in the former and so would probably turn to this mode of working at base, especially since QWERTY machines offer improved processing facilities and disc storage. Thus it is quite probable that the Microwriter will assume its most valuable function when regarded as a peripheral to a more sophisticated computer system.

(iii) Improved visual display : mention has already been made of the limited potential of the DSA system for those with poor residual vision. Given appropriate software, files dumped from Microwriter can be edited in an improved visual display. If transferred into Wordwise (BBC B), for example, editing can be carried out in a 40 column display and format checked in an 80 column mode. Wordwise is already extensively used by visually impaired people which would seem to suggest that these displays may meet the needs of many Microwriter users. Three programs are also being developed at the R.C.E.V.H. which may provide a solution for those unable to read 40 column display. Two are complementary in that one enables the user to write text and the other to read text in a variety of print thicknesses and sizes which can be selected to suit the individual. The third program, PRINTER, permits text to be printed in various styles and sizes on an Epson-compatible dot matrix printer. The Frank Audiodata might also provide a suitable visual display if a link can be established.

(iv) Braille transcription : it has already been suggested that some Microwriter users may wish to produce hardcopy braille, and it was noted that direct links established between embossers and the Microwriter were of little benefit since the output would be limited to a mixture of Grade I and 'computer braille' and thus unsuitable for most applications. If, however, files created on a Microwriter, are transferred to a microcomputer equipped with transcription software, then Grade II braille can be achieved. Fortunately, such software is now much improved and more generally available. As yet, however, very little work has been done in this area.

(v) Compatibility of systems : traditionally the visually impaired have been at a disadvantage as a result of reliance on specialist systems which bear little resemblance to those used by sighted peers. If the Microwriter, which in itself is a commercially available device, can be linked to educational and business systems then the visually impaired individual will be more easily accommodated in an educational or vocational setting.

Undoubtedly, this is the most significant area of development and the one which holds the key to the future of the Microwriter. Encouragement and support should be given to experimentation in this area.

(h). Soft Braille Devices

Such devices include the Versabraille, Brailink, Brailex, and a new soft braille peripheral reading device being developed in Bristol. Versabraille is a self-contained portable word processing system for the blind incorporating an electronic braille keyboard, 20 cell braille pin display, and cassette storage. A link between the Microwriter and Versabraille has been achieved but the advantages of such a link are limited. The Microwriter is smaller and lighter and may be used as a portable peripheral to prepare files for transfer to Versabraille. However, without also carrying a speech synthesizer the blind user would have no means of verification or editing. In addition, files input from Microwriter would be limited to Grade I braille. The Brailex offers similar facilities but has the disadvantage of not being portable and the advantage of incorporating disc storage. In this instance a link would seem to be more beneficial since a Microwriter's portability could be used for the preparation of files for transfer at base. As yet there are very few in the country and no evidence of a link. Brailink incorporates a pin display and a QWERTY keyboard with an option to use seven of its keys for braille input. In this instance the advantage of a link would again be with the Microwriter serving as a portable peripheral. The fourth device referred to above is an output device only which produces a braille display on a closed loop of tape. Developments in communication with this device may prove worthwhile and cost effective since it does not duplicate the word processing facilities available on the Microwriter but does provide an alternative method of verification and editing for the totally blind Microwriter user. Clearly, as yet there is insufficient evidence to indicate the potential or relevance of communication between the Microwriter and soft braille devices but it is undoubtedly an area worthy of investigation, particularly with the deaf-blind, or those who dislike synthetic speech, in mind.

(i) Reading Aids

A great deal has already been discussed concerning alternative visual and tactile output from the Microwriter. It can be used in conjunction with specialist reading aids but these cannot be regarded as peripherals since wiring is not involved. Such methods are, nevertheless, worthy of consideration. Using a CCTV system to read the Microwriter display can be achieved but the advantages are limited. Firstly portability, one of the Microwriter's key characteristics, is lost, and secondly, the user is still limited to the restricted-character Microwriter display for verification and editing. It should also be noted that some CCTV systems have proved unsuitable.

Discussions have taken place between the Foundation and Wormold International (suppliers of Viewscan and Viewscan Text System) with a view to using Viewscan as an add-on alternative display. Viewscan comprises a hand-held camera and portable screen enabling print to be magnified up to 64 times. Such a link would present many technical difficulties and is not likely to be developed. The Viewscan Text System (VTS) combines Viewscan with a modified Epson portable computer to serve as an information processing system for the

partially sighted. A link between the Microwriter and VTS has already been achieved and the advantages are similar to those already attributed to microcomputers in general. It should be noted, however, that VTS costs in the region of £4,500 and that similar facilities could be acquired at a small fraction of this amount with an appropriately equipped microcomputer. The principal advantage of VTS is portability which would not be relevant if the Microwriter was being used as a portable peripheral.

A new display incorporating an RS232 communication link is being developed at Brunel University and may go into production in 1985. The Foundation have been monitoring this development and it is likely that Microwriters will be amongst the first machines to be used with the new device. Unfortunately it will not be portable and its cost is not yet known. Unless competitively priced it is likely that microcomputers will remain a better option since they facilitate not only large-character display but additional processing facilities and disc storage.

Some totally blind users read the display by means of the Optacon, a portable battery-operated reading aid. Print is scanned by means of a hand-held camera and the image reproduced on a tactile array of vibrating rods. The Mark III display is more easily read but with careful adjustment the Mark IV display can be read by a skilled Optacon user. This presents the totally blind with an alternative method of review and editing but its usefulness is restricted by the fact that the operation of the Optacon requires two hands, thus preventing simultaneous control of the two machines.

(5) LEARNING AND TEACHING

(a) Self-tuition

Both Mark III and Mark IV models are supplied with two user guides, Book 1 introduces the code and Book 2 deals with more complex facilities and is primarily for reference. The basic expectation is therefore that the Microwriter can be self-taught, unlike typing or braille. Furthermore, fully sighted users would be expected to master the alphabet in a matter of hours, be writing useful documents in weeks, and be proficient in months. It is anticipated that fully sighted users will reach speeds of approximately one-hand-a-half times handwriting speed. Such a measure is obviously imprecise but the central consideration is whether or not the Microwriter proves more or less efficient than other methods of information processing available to the user. Mastery of the code is not dependent simply on the individual's ability to do so, but also on the presence or absence of incentive. The following points help to analyse user experiences:

(i) User Guides - the print in the Mark III guide is of an adequate size but of very poor quality and it should therefore be re-printed. Despite improved quality, the print in the Mark IV guide offers very poor contrast between print and paper colour and is far too small to be read by visually impaired users. It should also be reprinted in 10-pitch black print on white paper in A4 format. Totally blind users stress the need for Book 2, as well as Book 1, to be available in braille since reference to particular sections is virtually impossible on tape.

The content of the guides is clear although users without previous experience of microelectronic devices are likely to find Book 2 difficult. The cartoons and diagramatic representation of the alphabet are not generally considered helpful. Many favour a numbering system with the main keyboard labelled 1-5 from left to right.

(ii) Additional Material - additional information should be readily available to visually impaired users regarding other devices with which the Microwriter can usefully be combined to create more comprehensive communication systems. One solution might be the publication of a supplementary booklet or newsletter giving brief details of such devices, which could be up-dated and distributed annually. In addition, the Foundation could extend its present range of hand-outs to include sheets on more of the relevant devices. Such sheets might be written co-operatively with experienced users. Regular user-group meetings might also prove beneficial for the visually handicapped.

(iii) Approaches to Learning - learning the alphabet generally takes between 15 minutes and a couple of hours during the course of the day. Approaches to learning numeric and punctuation code vary. Some attempt to learn them systematically while the majority learn by reference as characters are required. A sensible method, combining the two approaches, would probably be to analyse the application and identify the character set required. This range of characters could then be learned systematically. A table showing the characters available in each of the four settings might possibly serve as a very rapid reference since all that is required is knowledge of the full range of combinations in the first setting.

(iv) Achievement - quantifiable evidence in terms of speed, accuracy and knowledge of code is not available. However, those who regard the Microwriter as useful in their work or study produce documents regularly and efficiently after about a month. Clearly, the code and operation of the Microwriter can be acquired more quickly than braille or typing, and without formal teaching, but the speeds which can ultimately be achieved do not match those possible on the two-handed QWERTY or braille keyboards. As already noted, efficiency is probably more usefully assessed in relation to the individual's needs and abilities rather than to objective measures. Evidence suggests that those in employment appeared to progress more rapidly than those in education, especially where systems are acquired by educational establishments and a member of staff undertakes mastery of the system - not for their own benefit - but in order to pass it on to students or pupils.

(b) Teaching Microwriting

The last section supports the view that Microwriting can be effectively self-taught. To what extent, therefore, is it appropriate to teach the system? This question in turn raises many others which must be considered:

(i) What are the Objectives in Teaching the System? - some establishments introduce microwriting to a limited number of pupils with a view to it becoming their principle means of communication while others introduce the system, to larger numbers, in order to assess aptitude or increase awareness of aids available. Clarification of objectives cannot be over-stressed and this fact is confirmed by evidence which suggests that microwriting becomes far better established in the former situation where the purpose is clear.

(ii) What Criteria are used for the Selection of Pupils? -

Sight - there is no level of sight at which microwriting is necessarily inappropriate, given the correct peripheral devices, but developments are necessary to improve verification and editing facilities for those with limited residual vision but who preferred to work through visual media rather than speech or braille. At present the Mark III fulfils this need but its unreliability, and the fact that it is no longer being manufactured, suggest that modification to the Mark IV display - or the production of an alternative portable add-on display - is required as a matter of urgency. The Microwriter might be particularly useful for pupils with deteriorating sight, for example, those suffering from Retinitis Pigmentosa. In such cases a decision has to be made as to whether to introduce braille while the pupil has sight but no inclination to use it, or to wait until he can no longer use print media thus temporarily leaving him without any medium for communication. The Microwriter offers an input method appropriate to the sighted and to the blind and it is only the output medium that would require alteration at the appropriate time. Thus, the transition is relatively smooth.

Intelligence - it is generally felt that the Microwriter is not a suitable aid for pupils of less than average intelligence. It is also true, of course, that pupils of low ability will process much less information and thus efficiency of input and output are less important.

Age - evidence from a variety of sources suggest that microwriting can be effectively mastered by pupils of age nine/ten and some experimentation is being carried out with younger children.

Additional Handicaps - there is some limited evidence of use with additionally handicapped pupils. In particular, it seems likely that the Microwriter could benefit pupils unable to master two-handed keyboards.

(iii) What Resources are Necessary for the Introduction of Microwriting in an Educational Establishment?

Timetable - clearly it is necessary to make provision for microwriting within the timetable but paradoxically, evidence seems to suggest that microwriting is less well established in institutions where it has been more formally timetabled. It is probably the distribution of time, combined with an attempt to share systems, that restricts progress. Evidence from vocational and social users, as well as from other sources, show conclusively that the skill can be acquired quickly and regular timetabling on perhaps a weekly basis is likely to be counter-productive. A more satisfactory approach would probably be one to half an hour daily for one/two weeks. After this period of initial training, occasional monitoring of use is all that is likely to be required.

Equipment - the Microwriter is essentially a personalized piece of equipment and should be for the sole use of the trainee - and available to him if training proves successful. Failure to adopt this principal is another factor contributing to disappointing progress in some establishments. Each pupil using microwriting for a large percentage of their work should be supplied with a Microwriter, microcassette recorder and DSA or voice synthesizer as appropriate for their exclusive use. These requirements are minimal and the system inadequate if they are not met. Additionally, the school or college should equip a resource area accessible to pupils and students at all times. Such an area should be equipped with DSA systems, synthesizers, printers, microcomputers for disc storage and embossers if appropriate. A whole range of other devices may also be incorporated to meet more specialized needs.

Staffing - the successful application of Microwriters supplied to institutions is dependent upon one or more staff taking it upon themselves to master the device and request the other facilities necessary for teaching. This is in many instances a considerable imposition given limitations of time, resources and co-operation of other staff. Having undertaken the role, however, specialist training should not be required but support in the form of meeting other users would undoubtedly be beneficial. It is also highly desirable for the member of staff concerned to be a skilled and committed user rather than learning the skill simply to pass it on. Certainly, each member of staff involved should be allocated a system for their own use and encouraged to use it in their work. Many applications are possible including the production of notes or worksheets simultaneously for print and braille output.

Teaching Materials - on the whole teachers do not distribute user guides to pupils, at least at an early stage. Some materials have been produced in order to convey particular aspects of the system. There is probably a place for a simplified reference manual in clear print and braille which takes account of the support that would be given by the teacher. Thus it would not be a self-tuition guide. A collection of exercises to develop speed and assess progress, possibly on tape, would be helpful.

(c) Applications in Education

Precise details are not available but applications include use within specialist establishments for school and home work, use by pupils/students integrated into mainstream schools and colleges and as a means of sitting public examinations. Clearly, it is more suited to subject areas requiring text of a straightforward nature and likely to be of little benefit in areas such as mathematics. Given that education entails so much information processing it is desirable that the Microwriter's main function would be as a portable note-taking device with the student having access to a more sophisticated system for dumping and storing files on disc.

(6) SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

(a) The Microwriter System

(i) General - the Microwriter is a light-weight one-hand operated processing device especially suited to portable use.

(ii) Reliability - with the exception of some difficulties in reading and writing to cassette, the evidence indicates that the Mark IV is a reliable machine. The Mark III, however, is prone to a whole range of problems and does not justify investment.

(b) Peripheral Devices

(i) Interfacing - the RS232 communications link enables the Microwriter to be interfaced to a whole range of peripheral devices thus making it a flexible multi-media system.

(ii) DSA - a system other than the Microwriter display itself is necessary for efficient editing and formatting of lengthy documents. The DSA system meets this need but the 64 character screen display cannot be read by some visually impaired users. Investigation into modifying the system or utilising other large-character devices would therefore be worthwhile.

(iii) Cassette Storage -- while it is an economic and useful facility problems with storage and retrieval are common. Access to disc storage is highly desirable where long-term storage of a large number of documents is necessary.

(iv) Printers - 10-pitch printing is adequate for most visually handicapped users.

(v) Embossers - investigation into hardcopy braille output would be beneficial although a direct link between the Microwriter and an embosser offers only limited facilities.

(vi) Speech - totally blind users adapt to the use of speech but those with any residual vision generally prefer a visual means of verification and editing. Experienced users use the synthesizer for review and editing and do not normally have speech turned on while writing documents.

(vii) Microcomputers - the Microwriter can serve as an alternative to the QWERTY keyboard but a link also facilitates improved processing facilities, large-character screen display and disc storage. It is likely that the Microwriter will, in many instances, be most beneficial when used as a portable data collection peripheral. Further investigation is desirable in this area.

(viii) Soft Braille - linked to soft braille terminals the Microwriter could be used as a data collection peripheral. Links might also be established for editing purposes but this would only be cost effective if a comparatively cheap soft braille device is developed for output only.

(ix) Reading Aids - a variety of reading aids can be used as complementary elements in a communication system. The Optacon and CCTV systems have been used to read the display but such applications are relevant to only a small number of users and are limited in efficiency.

(x) Designing Systems to Meet Needs - both the needs of individuals and the facilities offered by devices can be assessed in terms of input, storage, and output media. By means of a cross-reference the appropriate peripherals can be assembled to provide a comprehensive communication system to meet individual needs.

(c) Learning and Teaching

(i) Self-tuition - the Microwriter can be effectively self-taught with the expectation of producing useful documents within a month.

(ii) User Guides - while the content of the guides is adequate, the visual presentation is not suitable for visually impaired users and they should be reproduced in good quality 10-pitch print. Both Books 1 and 2 should be available in braille as well as on tape.

(iii) Guide Supplement - some supplementary information should be made available to visually impaired users regarding interfacing Microwriters to other specialist devices.

(iv) Approaches to Learning - most visually impaired users find a numbering system more effective than the pictorial system of learning the alphabet. Mastering the rest of the code should be geared to the specific application.

(v) Introducing Microwriting into Educational Establishments - consideration should be given to the objectives in teaching microwriting, to the criteria for selecting pupils, and to the timetable, hardware and staffing resources required.

(vi) Applications in Education - the Microwriter can be of benefit to pupils of all sight levels of average or above average intelligence. It can be mastered effectively by pupils at the top end of the primary age-range. It is not suited to all subject areas but is particularly useful where a portable and relatively quiet means of note-taking is required.

(d) The Microwriter in Perspective

(i) Comparative - the Microwriter is one of a range of devices which facilitates media-interchange and a multi-media approach. Having identified the communication needs of an individual, the appropriateness of the Microwriter should be assessed in relation to other systems.

(ii) General - given its limitations of memory, display size, cassette file access and speed of writing (relative to two-handed keyboards), the Microwriter should be seen as a portable data collection peripheral to a more efficient microcomputer-based communication system.

APPENDIX I

Information Sheets Available from the Foundation

The following information sheets can be obtained by writing to:

The Foundation for Communication for the Disabled,
25 High Street,
Woking,
Surrey.
GU21 1BW

Tele : 04862 27848.

(i) Comparison of Microwriters.

(ii) Dummy Keyboards.

(iii) Choosing a Printer for your Microwriter.

(iv) Voice Synthesis.

(v) Adapted Microwriters.

(vi) Learning to use the Microwriter.

(vii) Some examples of Disabled Microwriter Users.

(viii) Some Medical Conditions in which the Microwriter can Help.

(ix) The Microwriter for Blind and Partially Sighted People.

(x) Use of the Microwriter System in Schools and Colleges.

(xi) Use of the Microwriter by Disabled People in Employment.

(xii) News-sheet.